

Assessing the performance of business unit managers

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Abstract

Using a sample of 140 managers, we investigate the use of various performance metrics in determining the periodic assessment, bonus decisions, and career paths of business unit managers. We show that the weight on accounting return measures is associated with the authority of these managers, and we document that both disaggregated measures (expenses and revenues), and non-financial measures play a greater role as interdependencies between business units increase. The results suggest separate and distinct roles for different types of performance measures. Accounting return measures are used to create the proper incentives for managers with greater authority, while disaggregated and non-financial measures are employed in response to interdependencies.

JEL classification: M41

Keywords: performance measures, business units, managerial performance

* Tilburg University. We appreciate comments from Margaret Abernethy, Eddy Cardinaels, Henri Dekker, Peter Easton, Chris Ittner, Ken Merchant, Valeri Nikolaev, Mark Penno, Frank Selto, Steve Salterio, and Ann Vanstraelen, and also from workshop participants at the Vrije Universiteit Amsterdam, University of Antwerpen, University of Melbourne, Tilburg University, the 2004 Global Management Accounting Research Symposium, the 2005 Management Accounting Section mid-year meeting in Scottsdale, Arizona, and the 2005 European Accounting Association annual congress in Göteborg. We thank Merle Erickson (Editor) and an anonymous reviewer for their constructive feedback.

1. Introduction

To encourage rapid and relevant decision making, firms move towards organizational designs in which authority over operations and strategy is assigned to business unit managers (Aghion and Tirole 1997; Roberts 2004). However, empowering business unit managers is also likely to undermine cooperation among managers. We conjecture that different performance measures play different and distinct roles in evaluating the performance of business unit managers according to the organizational design of the firm. More specifically, we hypothesize that the use of accounting return measures provides incentives to managers to use their authority appropriately and that the use of disaggregated accounting measures, such as costs and revenues, as well as various non-financial measures, mitigates the individual manager's tendency to attach too little value to the impact of his or her decisions on other parts of the firm (Baiman and Baldenius 2006). To test these predictions, we use survey data on 140 business unit managers and assess the use of a range of measures for evaluating the performance of business unit managers.

Accounting return measures are more aggregated than profit measures, as they relate profit to resources employed (e.g., return on investment, residual income, return on capital). Profits, in turn, are more aggregated than expenses and revenues. Profits are thus an intermediate category between accounting return measures and fully disaggregated measures such as expenses and revenues. Following previous theoretical research, we assume that accounting return measures are the best choice for assessing the performance of a business unit manager and are more likely to be used when more authority is vested in the business unit manager. To the extent that return and profit measures substitute for each other, however, we will see shifts from returns to profits as the level of authority declines, as well as from more disaggregated measures to profits as the level of authority increases. We suggest that the primary function of disaggregated and non-financial measures is to reduce the noise in *aggregated* financial measures (accounting returns, profits) or to provide a signal about a manager's actions. We therefore posit that these measures are used when aggregated

accounting measures are noisy or when they are not sufficiently sensitive to the cooperative efforts of managers.

We document that accounting return and profit measures are associated with the level of *authority* of the business unit manager (relative to that of his or her superior) with regard to key decisions. In contrast, the use of disaggregated and non-financial measures, is associated with *interdependencies* among business units within the firm, i.e., the extent to which the decisions of one business unit manager affect other managers in the firm and vice versa.

This study builds on and extends early work by Scapens and Sale (1985) who seek but fail to establish an association between delegated authority and the use of accounting return metrics. Since this early work, relatively little progress has been made in identifying the circumstances under which firms use various types of performance measures,¹ perhaps because the classifications that researchers use are often too general (e.g., financial vs. non-financial or market vs. accounting measures). Thus, by analyzing four different types of performance measures — accounting return, profit, disaggregated, and non-financial measures — we contribute to the literature by distinguishing the differential effects of organizational design on the use of each metric type.

Ittner and Larcker (2001) warn that the use of performance measures is likely to vary with the decision context in which they are applied. To accommodate this possibility, we provide exploratory evidence on the use of different types of performance measures in three decision contexts: (1) the periodic assessment of business unit managers, (2) the determination of managers' bonuses, and (3) the determination of managers' long-term career paths. The literature is somewhat critical about the use of survey data in accounting research (Young 1996; Ittner and Larcker 2001; Zimmerman 2001). In performing our tests, we heed the warnings in the literature about potential measurement error, "leading" or "soft" questions, inadequate sampling, and inappropriate econometric techniques.

¹ Several authors (Gordon and Narayanan 1984; Chenhall and Morris 1986; Gul and Chia 1994; Scott and Tiessen 1999) investigate the association between organizational design and "broad control system" issues (Ittner and Larcker 2001).

Our finding that accounting return (profit) measures are used more (less) often when business unit managers enjoy more decision-making authority is important because some authors stress that the use of performance measures is independent of a manager's authority (Solomons 1965), whereas others maintain that profit and return measures are only meaningful if a manager has significant decision-making power (Vancil 1978). These views are often expressed when discussing the use of responsibility centers (emphasis added in the following excerpts):

“ ... A common misconception is that the term *profit center* (and in some cases investment center) is a synonym for a *decentralized subunit* ... [M]anagers in a division organized as a profit center may have little leeway in making decisions ...” (Horngren, Foster and Datar 1994, pg.863)

“Responsibility accounting is a term used to describe the use of accounting data in managerial evaluation. ... Authority and responsibility are distinct. For example, the manager of a fast food facility is usually evaluated as a profit center. Yet the menu and prices, not to mention cooking procedures and ingredients, are determined by central management. The manager has *little authority* but *considerable responsibility*.” (Demski 1994, pg. 538)

and, in contrast,

“ ... one of the major purposes behind the use of a profit center [is] to encourage local decision making and initiative. ... A profit center is a unit for which the manager has the *authority* to make decisions on sources of supply and choice of markets ...” (Kaplan and Atkinson 1989, pg. 590)

Our evidence takes issue with both sides of the debate. First, we show that the use of performance measures (and thus the designation of responsibility centers) is strongly correlated with the authority of business unit managers. At the same time, we believe that requiring investment or profit centers to be decentralized units *by definition* obfuscates the substantial observed variety in the authority of managers who are evaluated on accounting returns and/or profits. It also prevents researchers from investigating the mapping between performance measure and authority.

We find no evidence that the use of accounting return measures is affected by the presence of interdependencies, nor is the use of disaggregated and non-financial measures associated with the level of authority. Instead, firms use aggregated measures relatively more than disaggregated measures when more authority is delegated to business unit managers, and

disaggregated and non-financial measures gain more weight as interdependencies increase. In short, performance measures have very distinct roles: whereas the use of accounting return measures is correlated with the authority of business unit managers, disaggregated and non-financial measures are employed to provide incentives for managers to cooperate in the presence of interdependencies between business units.

2. Hypothesis development

2.1. Authority of business unit managers

Performance evaluation measures should fulfill two purposes: (1) to give managers incentives to use their authority optimally, and (2) to “disaggregate” the firm’s total economic performance into a summary estimate of each manager’s contribution to firm value (Zimmerman 1997; Raith 2005). Accounting return measures, designed to capture the economic value generated from specified resources (Scapens 1979; Anthony and Govindarajan 2004), should accomplish both purposes. However, the normative literature warns against using accounting return measures when the authority of managers does not extend to decisions about the acquisition of new resources or the disposal of existing resources:²

“Both the measure of performance and the standard against which it is compared must reflect the degree of control that the division manager can exert on profit and investment.” (Shillinglaw 1959, page 46)

Notwithstanding this warning, recent theoretical work concludes that accounting return measures provide not only information about how well resources are used, but also incentives that encourage optimal resource use (Reichelstein 1997; Rogerson 1997; Zimmerman 1997; Dutta and Reichelstein 1999). Even if managers have little authority over investment decisions, theory suggests that accounting return measures are informative (Holmstrom 1979; Indjejikian 1999) about the way in which managers wield their authority.

² The normative literature traditionally invokes the “controllability principle” to argue that managers should only be charged for the resources over which they have control. The controllability principle has been somewhat discredited in more recent theoretical (Indjejikian 1999) and empirical (Merchant 1989) work.

Note that while the managers in our sample do not typically have full investment authority,³ they substantially affect the use of current resources. Accounting return measures should therefore provide valuable information about their performance.

Extant empirical research supports textbook prescriptions calling for performance measures that capture the decisions and actions of managers (Chenhall and Morris 1986). Whereas earlier empirical work does not specify the *type* of metric that fulfils this purpose, we propose that accounting return measures summarize the performance of managers whose authority impacts the value of the resources they use (Scapens and Sale 1985, pg. 240), and we therefore expect a positive association between the weight on accounting return measures and the authority of business unit managers.

H1: The weight on accounting return measures in the evaluation of business unit managers is positively associated with their decision-making authority.

We also want to know whether an increased weight on accounting returns implies a reduction in the weight on disaggregated and non-financial measures. Agency models suggest that the relative importance of a performance measure depends on the “signal” provided by the measure about an employee’s action and the “noise” with which the actions are captured (Lambert and Larcker 1987; Banker and Datar 1989; Indjejikian 1999). Several authors have noted the lack of causal relation between aggregated financial measures and the actions of managers with low authority, and advocate the use of disaggregated and non-financial measures as being more directly under these managers’ control (Wruck and Jensen 1994; Ittner and Larcker 1998b; Ittner and Larcker 2003). Disaggregated and non-financial measures are less subject to exogenous events and therefore contain less noise. In contrast, accounting return measures are expected to be too coarse to provide desirable signals *and* lack precision when managers have little authority (Horngren 2004). This “signal-to-noise” argument suggests a negative association between authority and the use of disaggregated and non-financial measures.

³ Managers are said to have *full* investment authority if they can acquire or dispose fixed assets without prior approval from their superior.

On the other hand, more recent models that consider the implications of allowing agents to perform multiple, heterogeneous tasks would seem to support a *positive* association between authority and the use of disaggregated and non-financial measures. The chief concern in these “multi-tasking” models is to ensure that managers choose the combination of actions that will support the firm’s objective (Indjejikian 1999). Gersbach (1998) demonstrates that specific, task-related measures are preferred to one broad, aggregated measure when managers face multiple tasks, although Feltham and Xie (1994) suggest that the use of multiple measures will induce managers to allocate effort across tasks suboptimally. An often-voiced concern is that managers will allocate too much attention to tasks that have an immediate impact on performance at the cost of tasks whose benefits will be realized in the future (Hemmer 1996; Hayes and Schaefer 2000; Smith 2002). Future performance is not directly observable (or contractible), although earlier empirical work shows that non-financial measures are often associated with future performance (Ittner and Larcker 1998a; Banker, Potter and Srinivasan 2000; Ittner, Larcker and Randall 2003; Bryant, Jones and Widener 2004). In addition, Fairfield, Sweeney and Yohn (1996) show that disaggregating financial measures improves their predictive abilities with regard to future profitability. Thus, the use of non-financial and disaggregated measures can discourage managers from improving short-run performance to the detriment of future profitability.

To summarize, while under both single and multi-task agency models we expect a relation between authority and the use of disaggregated and non-financial measures, it is unclear which direction the relation will take.⁴ We therefore hypothesize:

H2: The weight on disaggregated measures in the evaluation of business unit managers is associated with their authority.

⁴ Other theory on the use of non-financial and disaggregated measures includes the observation that non-financial measures are often very concrete “behavioral” measures (Ittner and Larcker 2002), i.e., measures that recommend or prohibit certain actions by managers (e.g., absenteeism, safety inspection ratings). As profit center managers receive more authority, it becomes increasingly important to ensure that their actions do not cross boundaries to the detriment of the firm; non-financial measures are one way to clearly communicate to managers what behavior is acceptable and what is not.

H3: The weight on non-financial measures in the evaluation of business unit managers is associated with their authority.

We do not state formal expectations about the weight on profit measures as profits are the intermediate category between accounting return measures and fully disaggregated measures such as expenses and revenues. When accounting return measures receive more weight, this will likely result in a *decrease* in the weight on profit measures (because weight is “shifted” from profits toward accounting returns). On the other hand, if disaggregated measures are used less as authority increases, it is likely that the weight on profit measures *increases* (because weight is shifted from disaggregated measures to profits). Which of these alternatives dominates is an empirical matter.

2.2 Interdependencies

Performance metrics used at lower levels in the hierarchy become increasingly noisy as interdependencies among units within the firm increase (Bushman, Indjejikian and Smith 1995; Keating 1997; Abernethy, Bouwens and van Lent 2004) because the indivisibility of certain resources makes the attribution of performance to individual managers or units within the firm increasingly difficult. For instance, while all business units of a firm benefit from brand name effects, allocation of the brand name’s value to any individual unit is an arbitrary exercise. The problem of attributing performance to individual business unit managers becomes less severe as one moves from accounting return measures to profits to more disaggregated measures. We therefore expect the following relation between the use of accounting return measures and interdependencies:

H4: The weight on accounting return measures in the evaluation of business unit managers is negatively associated with the degree of interdependency among business units.

How changes in the weight on accounting return measures affect the use of profits and disaggregated measures depends on the type of interdependencies. If the appropriate allocation of (indivisible) resources to a business unit is the main difficulty, then profits are a better summary measure of performance. However, interdependencies can also arise due to

joint production functions or joint demand functions (Milgrom and Roberts 1992), in which case, further disaggregation of profits into expenses and revenues may be needed. With joint production functions, for example, the unique attribution of expenses becomes tenuous and we are thus likely to see revenues receive more weight in the performance evaluation than either profits or accounting return measures. Similarly, if multiple business units have to cooperate to serve the same customer, the attribution of revenues to these business units becomes difficult and we expect that expense measures are likely to receive more weight than either accounting return or profit measures. In short, aggregated profits weights expenses and revenues equally by definition, although their “signal-to-noise” ratios may be different (Holmstrom 1979; Banker and Datar 1989; Feltham and Xie 1994); disaggregation allows for non-equal weighting to reflect differences in the signal and/or noise of the various profit components.

We cannot unambiguously infer what will happen to the weight on profit measures, which may either *increase* (owing to a shift from accounting return measures to profit measures) or *decrease* (due to a shift from profit measures to disaggregated measures). However, we can derive signed predictions for the weight on disaggregated measures:

H5: The weight on *disaggregated measures* in the evaluation of a business unit manager is positively associated with the level of interdependencies among the business units.

Banker et al. (1995) argue that “detailed performance evaluations should include quality, material use (yield), labor use (yield), and service measures that the [business unit manager] can control” (pg. 498). Similarly, Hirsch (1994, pg. 609) notes that non-financial measures can be used in an integrated way to show “how managers are achieving the goals and objectives of the company rather than how they might be optimizing some local measures irrespective of global company outcomes.” Baiman and Baldenius (2006) show that non-financial measures can signal whether managers act in a cooperative fashion or can put bounds on non-cooperative behavior. We therefore hypothesize the following relation:

H6: The weight on *non-financial measures* in the evaluation of a business unit manager is positively associated with the level of interdependencies in the unit.

Table 1 summarizes our predictions.

3. Full model, sample selection, variable measurement, and estimation

3.1. Full model

We argue that the type of performance measure used in business units is conditional on the authority of the business unit manager and the degree of interdependencies among business units. Prior research, however, shows that the authority of managers is itself a function of interdependencies⁵ (Jensen and Meckling 1992; Christie, Joye and Watts 2003; Abernethy et al. 2004; Roberts 2004)⁶ and information asymmetry (Wruck and Jensen 1994; Baiman, Larcker and Rajan 1995; Nagar 2002; Christie et al. 2003; Abernethy et al. 2004; Roberts 2004). Fig. 1 summarizes this discussion.⁷

3.2. Sample selection

Our unit of observation is the business unit manager.⁸ We select our sample randomly from a database that contains addresses of firms domiciled in the Netherlands. Using firms' annual reports and, in some cases, phone calls with representatives of the company, we establish whether the firm is of sufficient size to have more than one business unit. Student teams then requested that qualifying firms participate in our project and administered the

⁵ We rely on earlier work to argue that interdependencies may be taken as a given when considering individual business units as they typically arise from joint costs and production functions or dependent demand functions (Milgrom and Roberts 1992; Abernethy et al. 2004).

⁶ Transfer pricing is another mechanism used to deal with interdependencies among units in the firm (see, e.g., Zimmerman 2003). If transfer prices are set perfectly, they should be able to reduce the problems associated with interdependencies and admit authority to be delegated to business unit managers. It is unlikely, however, that transfer prices can be set perfectly. Top management will often lack the knowledge necessary to design a pricing system that fully reflects all the ways in which decisions of business unit managers impact on each other. What's more, in many countries tax laws prescribe firms to use market prices, which limits management's discretion to use transfer prices to mitigate incentive problems.

⁷ While we do not hypothesize a relation between information asymmetry and the weight on return measures (or any other performance measures), we do not restrict the relation between these variables to zero since extant research suggests that such a relation exists (Keating 1997; Demers, Shackell and Widener 2004). On theoretical grounds, we expect that any impact of information asymmetry on the weight on performance measures will be indirect *via* its impact on the authority of business unit managers. This expectation is consistent with the empirical findings in Abernethy et al. (2004).

⁸ Firms were asked to identify the lowest level organizational unit that still had full production *and* sales tasks.

questionnaire on-site. This procedure produced a high response rate: 89% of our 140 sample firms agreed to have a business unit manager meet with one of the student teams.⁹ In ten firms, students spoke with more than one business unit manager; thus, the final sample of business unit managers consists of 140 observations from 125 firms.¹⁰ Untabulated analysis of the final sample reveals no obvious bias in terms of size or respondent characteristics.¹¹ Finally, author follow-up calls with respondents verified that the student teams followed the study's protocol.

Table 2, Panel A, reports summary statistics about the sample business units. The average business unit has 240 employees (median = 120) and represents 20.5% of its firm's total sales (16.4% of total assets). In terms of industry affiliation, 60 business units are in the service industry, 20 are engaged in financial services, with the remaining 60 in manufacturing. Compared to the population of Dutch firms with more than 100 employees (to proxy for our requirement that sample firms have more than one business unit), our sample includes more business units from the manufacturing industry (population = 34%) and financial services (population = 9%) and fewer from the service industry (population = 57%).

Table 2, Panel B, contains descriptive statistics about the sample respondents. Business unit managers are between the ages of 35 and 39 on average, although the median is between 40 and 44. Most respondents have a university degree. The longevity of managers in

⁹ This response rate is high compared to what is usually reported in relation to mail or telephone surveys. We believe this reflects the effort we put in contacting each firm personally and explaining to one of the top executives what we hoped to achieve. In addition, the fact that we mention that student teams would visit the firm on-site also is likely to have provided a clear signal of the researchers' commitment to the project.

¹⁰ We also run all analyses on a sample (of 125 observations) in which we include just one observation per firm. This does not change our results.

¹¹ There is also a question of how it is that managers know the (weights on) performance measures their superior uses to evaluate their work. If managers are unaware of these matters, then our dependent variables may suffer from measurement error. Student teams are instructed to ask managers to consult with company manuals or their superior if they have doubts about the specifics of their performance evaluations. In questionnaire pre-tests, we find that performance measures and their importance are a matter of routine discussion at periodic performance appraisals between the business unit managers and their boss and our respondents are generally knowledgeable about the (importance of) performance criteria. We further explore the potential impact of measurement error by conducting our analysis on a subsample of 104 managers who report that their bonus is determined using an explicit formula that specifies the measures and their weights used to compute the bonus awarded to managers. Managers with formula-based bonuses should be more certain about the weight on performance measures than those without formula-based bonuses. We replicate all findings in the subsample of managers with formula-based bonuses and thus we conclude that our respondents seem to be well aware of which measures are used to evaluate their performance.

their current organizational unit is 6.5 years on average (median = 4 years), and managers have about four years' experience in their current position (median = 2 years). The median respondent is slightly less experienced than his or her immediate superior both in the firm (1.5 years less experience) and in the industry (2.5 years less experience).

3.2. Variable measurement

The Appendix contains an overview of all survey items and scales reported in this paper. Table 3 contains descriptive statistics based on the original scales of all survey items that we use to measure the latent variables. We use factor analysis to pre-test the measurement properties of our variables (Hair, Anderson, Tatham and Black 1998; Chenhall 2005),¹² and the results suggest that our constructs display good reliability and construct validity.

3.2.1. Main variables

Weight on performance measure: We ask respondents to report the weight their *superior* assigns to a range of possible performance measures in the context of three decisions: (1) the periodic assessment of the respondent's performance, (2) the determination of the respondent's bonus, and (3) the determination of the respondent's future career. There are two main reasons to study more than one use of performance measures. First, the determinants of a performance measure's weight may depend on its use (Ittner and Larcker 2001). We provide evidence on the degree to which the authority of business unit managers and business unit interdependencies are important determinants of each of these different uses of performance measures. Second, while the three decisions we investigate are distinct, they are still somewhat related in the sense that we describe the weight on performance measures in the context of managerial evaluation and remuneration. We may therefore consider each of the three uses of performance metrics as checks on the validity of the others.

¹² Specifically, we conduct factor analyses on each multi-item measure separately and on all latent variables with multiple items jointly and show that the constructs are unidimensional and exhibit a "clean" factor structure (i.e., each item loads on the factor it is theoretically associated with and not significantly on any other factor. The joint factor analysis also allows us to assess the potential for common rater bias (Harman 1967). Our results strongly suggest that the common rater bias is not a problem in this dataset.

Within this multidecision context, we use six different categories of performance measures: (1) stock-price-related metrics, (2) non-financial metrics, (3) profit metrics, (4) disaggregated measures such as revenue and cost metrics, (5) accounting return metrics, and (6) other metrics. We use the weight a respondent places on category (5) in our empirical tests of hypotheses 1 and 4 about the relation between the use of accounting returns and authority or interdependencies; the weight on category (2) in our empirical tests of hypotheses 3 and 6 about the relation between the use of non-financial metrics and authority or interdependencies, and the weight on category (4) in the tests of hypotheses 2 and 5 about the relation between the use of disaggregated measures and authority or interdependencies.

Following the admonition of Ittner and Larcker (2001), we take care to elicit “harder” responses in our survey questions. In particular, we specify the decision context for particular performance measures and we ask for the actual weight placed on a range of performance measures (rather than determining the use of each by Likert scales). We also do not force respondents to rank measures that may in fact be (almost) equally important.

Authority of business unit managers: We ask respondents to evaluate differences in authority between themselves and their immediate superiors in four major areas: strategy, investments, marketing, and human resources. This approach is consistent with that of earlier studies (e.g., Gordon and Narayanan 1984; Abernethy et al. 2004). Our estimation procedure (see below) delivers measurement model measures of internal consistency, measurement error, and discriminant validity (Fornell and Larcker 1981). These findings,¹³ in addition to Cronbach’s alpha (0.73), support the use of the four-item measure as a unidimensional construct.

Interdependencies: Following Keating (1997), we ask about the extent to which other business units impact the performance of the respondent’s unit, and we ask about the extent to which the respondent’s business unit impacts the performance of other units. We also ask about the extent to which the business unit could operate as an independent, stand-alone firm. While some prior studies follow Keating (1997) and use each survey item as a separate

¹³ Untabulated, but available from the authors upon request.

variable, the results of the pre-test factor analysis, measurement model, and Cronbach's alpha (0.63) suggest that the three items be combined in a composite construct.

In addition, we compute the correlation between our construct and the percentage of a business unit's total production that is delivered to other units within the firm. When more goods or services are provided to other units in the firm, interdependencies will be higher. We find that the correlation between the two variables is positive and significant (correlation = 0.50, p -value = 0.01), which suggests that our construct exhibits convergent validity.

3.2.2. Control variables

We control for the potentially confounding effects of information asymmetry, size, and industry affiliation on the weight of a performance measure and the authority of business unit managers.

Information asymmetry: We rely on Dunk's (1993) six-item scale to measure the extent of information asymmetry between a respondent and his or her superior. The results of the measurement model and Cronbach's alpha (0.83) are consistent with using this scale as a unidimensional construct. We provide further evidence on the convergent validity of our information asymmetry measure by correlating the measure with characteristics of respondents that reflect their accumulated experience and knowledge. As a manager's experience grows, there is an increasing likelihood that his or her knowledge base exceeds that of the immediate superior. In untabulated results, we find significant, positive correlations between each of these characteristics and information asymmetry, which we construe as evidence of convergent validity.

Size: Size is the natural logarithm of the number of employees that work in the business unit of the respondent.¹⁴

Industry affiliation: We ask respondents to report the main industry in which their business unit operates (manufacturing, financial services, and other services), and we denote each by an indicator variable.

¹⁴ We also conduct robustness checks, which include firm size (in addition to business unit size) as a control variable. Including firm size does not change our results substantively. Details are available from the authors upon request.

3.3. Model estimation and econometric issues

In our model, the weight of a performance measure is frequently equal to zero and it cannot take values below zero. This implies that the data are potentially censored and are unlikely to have a normal distribution. Thus, we estimate our causal model using a latent variable technique that has been shown to provide robust results in small-sample settings in which the usual distributional assumptions are unlikely to hold (Fornell and Cha 1994). Specifically, we apply partial least squares (PLS); PLS also allows the researcher to deal with measurement error and to provide evidence on construct validity (Ittner and Larcker 2001).¹⁵

Path models with latent variables in PLS modeling consist of three parts: (1) the structural model, which depicts the relations among the latent variables as suggested by theory, (2) the measurement model, which defines the relations between the manifest variables (indicators) and the latent variables, and (3) the weight relations, which rescale the loadings of the manifest variables to make the variance of the latent variables equal to unity. Estimation in PLS proceeds in an iterative fashion whereby a set of model parameters is divided into subsets and estimated by ordinary least square (OLS), with the values of parameters in other subsets taken as given (Fornell and Cha 1994). We evaluate the statistical significance of the resulting parameter estimates of the structural model using a bootstrapping procedure (1,000 samples with replacement; all samples have the same size as the original sample).¹⁶

¹⁵ We choose PLS instead of alternative latent variable estimation methods, such as LISREL or other covariance-based structural equation models, for the following reasons. First, PLS has superior properties in samples of less than 250 observations (Hu and Bentler 1995). Second, covariance-based models assume that observations are independent and the observed variables are normally distributed, which is unrealistic given the measurement scales used in the survey. Finally, covariance-based models are full information estimation techniques, whereas PLS is a limited information estimation technique. While full information estimation is more efficient, it is also vulnerable to model misspecification. Unless theory is sufficiently strong about which variables matter and the relation among these variables, the more conservative approach is to use a limited information technique (Chin and Newsted 1999).

¹⁶ The bootstrapping procedure should provide more reasonable confidence intervals using our censored and potentially non-normal data. In our sample, OLS standard errors (untabulated) are lower than those derived using the bootstrap method. To provide some insights into the robustness of our analyses, we also estimated a model for only non-zero values of the weight on a performance measure using PLS, and a logit model with an indicator variable (1 = performance measure is used) as the dependent variable. The results of these two sensitivity tests are similar to those reported and our conclusions remained unchanged.

4. Results

Table 4, Panels A and B, report descriptive statistics on the use of the six different performance measure categories. In Table 5, we report the Pearson correlations among our variables. Table 6, Panels A through D, presents the results of each of the four causal models.

4.1. Summary statistics

Table 4, Panel A, shows that 58% of the business unit managers in our sample are evaluated on accounting return measures. Within this subsample of managers, the accounting return measure that is used most (68% of respondents) is return on investment (or return on net assets or return on capital employed); the remainder use either residual income or economic value added (18%), cash flow return-on-investment (11%), or shareholder value added (3%). Although the results vary across the three different decisions (periodic assessment, bonus determination, and career), in all cases at least 40% of the respondents report that their superior uses accounting return measures.

Profit receives the most weight in each of the three decisions, accounting for 39% of the measures in periodic assessments, 47% in bonus determinations, and 32% in career-related decisions (Panel B). The average weight on accounting return measures is 14.3% for periodic assessments, 12.9% for bonus determinations, and 9.9% for career-related decisions. There is considerable skewness in the distribution, however, as the median respondent reports weights of 7.0%, 0.0%, and 0.0%, respectively, for accounting returns. Notice that for most performance measures the weight differs significantly across the three decision contexts: for bonus determination, profit measures are used most, whereas for career-related decisions, “other measures” receive relatively more weight.¹⁷ Upon closer analysis of the responses to

¹⁷ The mean weight on most performance measures differs across decision contexts. The results of a paired sample *t*-test shows that:

1. In a comparison of the mean weight on each measure in the periodic assessment and bonus determination, only non-financial measures and accounting return measures are not significantly different.
2. In a comparison of the mean weight on each measure in the periodic assessment and career-related decisions, only stock price-related measures are not significantly different.

this question, we find that many respondents report that subjective measures about “personal growth” and “leadership skills” are important for decisions regarding their career.

Non-financial measures are used with some frequency. Their average weight ranges between 18% and 25%. Significantly fewer companies use non-financial measures for bonus and career decisions than for periodic performance evaluation.

Table 5 reports the Pearson correlations among all variables in this study. We find that accounting return measures are strongly positively associated with the authority of business unit managers and significantly negatively related to interdependencies among business units. In contrast, disaggregated measures are negatively correlated with the authority of business unit managers and strongly positively with interdependencies. Non-financial measures appear only to be (positively) associated with interdependencies. Profit measures are negatively associated with both authority and interdependencies. We also find that information asymmetry and interdependencies are significantly associated with the authority of business unit managers. These findings provide preliminary support for our hypotheses and for our model.

4.2. Full model results¹⁸

4.2.1. Results for the weight on performance measures

Hypothesis H1 conjectures that the weight on accounting return measures is positively associated with the authority of business unit managers. We find evidence consistent with this hypothesis in the context of all three decisions we consider. Table 6,

3. In a comparison of the mean weight on each measure in the bonus determination and career-related decisions, only accounting return measures are not significantly different.

¹⁸ We have 12 sets of estimates for the paths between (1) information asymmetry and (2) interdependencies and the authority of business unit managers. We do not expect the estimates of these paths to change very much across the different models, since the PLS algorithm considers these paths in relative isolation from the remainder of the model (linking interdependencies, information asymmetry and authority of business unit managers to the (relative) weight on performance measures). Indeed, our results turn out to be very consistent across the 12 models. We summarize the estimation results in Table 7. Notice that we control for size and industry affiliation when estimating each model. For brevity, we suppress details in the description of the results. We find that interdependencies are negatively associated with the authority of business unit managers in all models, albeit in two cases the path is not significant (mean coefficient = -0.22, mean *t*-statistic = -2.37). Information asymmetry is consistently positively associated with the authority of business unit managers (mean coefficient = 0.44, mean *t*-statistic = 3.69). This path is significant in all causal models. On average, the explanatory power for the authority of business unit managers is 31.0% (as measured by the Multiple R²).

Panel A, presents the details of the PLS estimation of our model. The coefficient values of the path connecting authority with the weight on accounting return measures are 0.33 (periodic performance assessment), 0.34 (bonus determination), and 0.25 (career-related decisions), with p -values equal to 0.001, 0.001, and 0.02, respectively.

Hypotheses H2 and H3 summarize our expectations about what happens with the weights on disaggregated and non-financial measures as the authority of business unit managers changes. Recall that we do not have a signed prediction for these measures, as the single and multiple task agency models point in opposite directions. As Panel C of Table 6 indicates, the association between disaggregated measures and the authority of business unit managers is never significant. Similarly, our results on non-financial measures, reported in Panel D of Table 6, are inconclusive. In all three decision contexts we consider, the association between the authority of business unit managers and the weight on non-financial measures is insignificant.

While we have no predictions for the weight on profit measures when authority changes, we find strong evidence in Panel B of Table 6 that profits are used *less* when authority increases (coefficients are -0.35 , -0.37 , and -0.24 , p -values are 0.02, 0.04, and 0.16). Together with the findings on hypotheses H1 and H2, this suggests that weight is moved away from profits towards accounting return measures as authority increases.

Hypothesis H4 predicts that accounting return measures are used less when interdependencies increase. Table 6, Panel A, shows that our evidence is inconsistent with this prediction. In fact, we find marginal support only for the association between accounting return measures and bonus decisions. Coefficient values are 0.08, -0.14 , and -0.13 (p -values are 0.20, 0.05, and 0.11).

As hypothesis H5 predicts, the evidence in Panel C of Table 6 suggests that disaggregated measures receive more weight as interdependencies between business units grow. While the coefficient value is somewhat less significant in the context of periodic assessment, interdependencies are strongly positively associated with the weight on

disaggregated measures in the two other decision contexts (coefficient values are 0.17, 0.48, and 0.29; p -values are 0.06, 0.001, and 0.01).

In hypothesis H6 we argue that non-financial measures receive more weight when interdependencies are more important. Our evidence in Panel D of Table 6 strongly supports this hypothesis for periodic assessment and bonus decisions, but only marginally for career-related decisions (coefficients 0.46, 0.42, and 0.13; p -values 0.001, 0.001, and 0.12).

We argue that it is not clear how the weight on profit measures changes as interdependencies increase. The empirical evidence (reported in Table 6, Panel B) suggests that the weight on profit measures is negatively associated with interdependencies (coefficients are -0.38 , -0.36 , and -0.10 ; p -values are 0.001, 0.004, and 0.44). Combined with our earlier findings, this suggests that weight is moved away from profit measures toward disaggregated and non-financial measures in response to increasing interdependencies.

4.2.2. Additional analyses

The role of investment authority. Our results indicate that the *overall* authority of managers is positively associated with the use of accounting return measures. One question that remains unanswered, however, is whether the authority of managers over investments (which is part of our composite measure of business unit manager authority) drives this result. Many writers argue strongly in favor of the “controllability principle” and warn that accounting return measures should be used only if managers can exercise direct control over the resources in their unit. We investigate this matter by separating out from the authority of business unit manager variable the item that asks respondents about their authority over investments and then running all models with both the modified authority variable and the one-item construct that measures the respondent’s investment authority.¹⁹ The findings of this (untabulated) analysis support the idea that managers who possess authority over investment decisions are

¹⁹ Note that the results from this analysis should be interpreted with due care. Earlier factor analyses and results from the measurement model indicate strongly that our original construct, which measures the authority of a business unit manager, is unidimensional, has strong internal consistency and reliability, and good discriminant validity. These properties are compromised by separating out the investment authority item. In addition, basing inferences on a one-item construct is hazardous. Finally, the correlation between the investment authority item and the modified authority construct is high (average correlation = 0.45), which may cause multi-collinearity problems in the reported regressions.

evaluated more (less) on accounting return (profit) measures. We also find some evidence that non-financial measures (in bonus and career decisions) and disaggregated measures (in periodic assessment and bonus decisions) receive more weight in response to increasing investment authority. These results are consistent with the conjecture that investment rights drive the use of accounting return measures and that non-financial and disaggregated measures are used to give managers incentives to use investment rights for the *long-term* benefit of the firm (as predicted by the multiple task agency models). The findings with regard to the association between the weight of performance measures and interdependencies remain unchanged in these regressions.

Given the importance of investment authority, we conducted follow-up interviews to establish a more complete picture of the investment rights of the business unit managers in our sample. We conducted semi-structured interviews²⁰ with a subsample of 32 respondents who have moderate-to-complete investment authority (score of 4 or higher on the scale reproduced in Panel B of the Appendix).²¹ In almost all cases, managers need to submit an investment plan to their superior for approval; only three respondents indicated that they can make investment decisions without even *informing* their manager. Once a plan has been approved, the authority of the respondents varies considerably with the type of investment in question. Respondents are most restricted (have low authority) with regard to decisions that involve capacity *extensions*. Indeed, one manager, who heads a business unit in the fast-moving consumer goods industry, observes:

“It is remarkable how much freedom I have to employ or deploy people in [marketing and product] development activities, while I have only limited discretion in acquiring assets that go on the balance sheet and require depreciation.”

We find that investments in new buildings require prior approval from the respondent’s manager in 72% of the sample. In contrast, replacement of production capacity or R&D expenditures must be approved in advance in only 25% and 16% of the sample,

²⁰ The investment authority-related questions used in the interviews are reported in the appendix.

²¹ 76 respondents fulfill this criterion. Of these, 25 respondents asked to remain anonymous in our original survey; 14 respondents had left their firm and we could not trace their current whereabouts; five refused to be included in the follow-up interviews.

respectively. Spending limits as defined in the pre-approved investment plan vary as expected with the scores on the investment authority scale. The average spending limit for respondents with moderate (score = 4) investment authority is €240,000. The average limit increases to €660,000, €3,290,000, and €3,420,000 with increasing levels of investment authority (score = 5, 6, and 7), respectively.²² Taking these observations together, we conclude that even managers who indicate that they have very substantial investment authority are usually subject to oversight with regard to investments in fixed assets. In that sense, it would seem that the managers in our sample exert considerable influence over the investment decision (in the planning and implementation stages), but their discretion is clearly bounded. It appears that the use of accounting return measures is more consistent with *creating incentives* for these managers to use the assets at their disposal appropriately than with *evaluating* their decisions on the disposal/acquisition of fixed assets. Notice that the average weight on accounting return measures is low compared with the weight on profit measures, and that in many cases (50% of the sample in the periodic assessment context) both accounting return measures *and* profit measures are used to evaluate managers.

“Higher-level” performance measures. Some authors point to the use of “higher-level” performance measures such as a firm’s stock price or firm-level profit to address problems associated with interdependencies between business units (Bushman et al. 1995; Keating 1997; Abernethy et al. 2004). The performance of a single business unit manager is then evaluated with measures that reflect the joint performance of two or more managers. The focus in this paper is not on the use of higher-level measures, but rather on the *type* of measure. To ensure that our results are not driven by the possibility that some types of measure are often defined at a higher level than others, we ask respondents to indicate how

²² These follow-up results may appear somewhat surprising given that these managers seem fairly constrained in their investment authority while they indicated earlier that they enjoy moderate-to-complete authority in these decisions. Our explanation is that spending *within* the investment budget is at the discretion of the respondent and their original answers most likely referred to investment choices made within the budget. In the interviews, many managers emphasized that even when they lack final authority over investments, they still exert considerable influence over these decisions due to their involvement with the investment plan. Future researchers might find it helpful to explore the spending limits defined in these plans as an alternative proxy for investment authority. Spending limits have the additional benefit of not relying on respondent perceptions.

much weight is given to measures defined at their own level compared to higher-level measures and re-run our analyses (see the Appendix). The results (untabulated) remain very much the same with a control variable for the use of higher-level measures: the signs on all the hypothesized relations do not change and their significance is generally only marginally affected.

5. Discussion, limitations, and conclusions

Performance measures are expected to provide managers incentives to work towards the accomplishment of firm objectives and to promote cooperation within the firm. As such, theory suggests that the authority of business unit managers and interdependencies among business units are important determinants of the weights placed on different performance measures. Our main proposition is that accounting return measures, while always informative about the actions of business unit managers, gain particular importance when these managers have more decision-making authority. We take the degree of authority that business unit managers enjoy as a proxy for the impact of managerial actions on the value of resources. We find evidence that accounting return measures receive more weight in periodic assessment, bonus determination, and career decisions related to business unit managers who have more authority. Additional analysis suggests that the use of accounting return measures is more pronounced when managers have more influence on *investment* decisions, even though the *de facto* investment authority of the manager does not extend to increasing the investment base and/or is subject to strict spending limits and pre-approval requirements.

We also show that accounting return measures increase in importance vis-à-vis profit measures as authority increases. We conclude that as authority increases, weight shifts towards measures that not only summarize the actions taken by the business unit manager but also provide incentives for the appropriate use of resources.

In contrast, theory is equivocal with respect to the expected association between the level of authority and disaggregated or non-financial measures of performance. On the one hand, such measures may be informative about the decisions of business units managers with little authority (in which case accounting return measures are likely to be too coarse), but

these metrics may also be used when managers have extensive decision-making responsibilities to focus attention on the impact of current decisions on future performance or to help mitigate the problems associated with “gaming” the performance measurement system. Perhaps due to these conflicting possibilities, we do not find a relation between authority and either disaggregated or non-financial measures. Alternatively, our approach may lack statistical power to discriminate between these two competing predictions.

In the presence of interdependencies, such as joint demand or production functions, ensuring cooperation among business unit managers is not a straightforward task. We find that firms do not reduce their use of accounting return measures in an effort to encourage cooperation but instead add weight to disaggregated measures such as expenses and revenues, and non-financial measures, which are less susceptible to the effects of these interdependencies. Both categories appear to play a key role in “managing” interdependencies. This is a potentially important finding because extant work that models the choice of non-financial measures omits this variable from analysis (e.g., Ittner, Larcker and Rajan 1997; Ittner et al. 2003; Said, HassabElnaby and Wier 2003). Our theory suggests that non-financial measures are used in response to increasing interdependencies because they are able to reduce the noise in accounting measures. Our data do not admit further exploration of this issue, however, as our “non-financial measure” category is not very descriptive, and in fact our findings for non-financial measures should be interpreted with care in view of the relative coarseness of the classification we use. Classifying the ability of different non-financial measures to cope with interdependencies may be a useful avenue for future work.

While this study is susceptible to the criticisms frequently raised in association with survey-based research, we take extensive precautions to mitigate the concerns relating to: (1) reliability and validity of the constructs, (2) narrowness of the survey and lack of information about organizational practices, (3) specificity of the survey questions, and (4) reliance on perceptions instead of hard data. However, several issues remain. Because only one respondent in each business unit answers our questions, the data may be subject to a common-rater bias (although tests results are not consistent with the presence of such a bias).

Moreover, despite our use of PLS estimation, we cannot rule out the possibility that measurement error still may affect our results. In addition, while the relations we test are informed by theory and prior empirical work, we have a cross-sectional data set and therefore cannot make causal interpretations, nor can we exclude the possibility that we omit a variable that is causally linked to our model. Finally, our unit of analysis is that of the business unit manager. Thus, we cannot generalize these findings to managers of other types of units (division managers, department managers).

Notwithstanding the above limitations, this paper takes up issues about which accountants have surprisingly strong opinions given the scarcity of empirical evidence.

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Table 1
Predictive effects investigated in this study

Dependent variable:	Test variable: <i>Authority of Business Unit Manager</i>	Test variable: <i>Interdependencies</i>
Weight on Accounting Return Measures	H1: +	H4: —
Weight on Disaggregated Measures	H2: ?	H5: +
Weight on Non-Financial Measures	H3: ?	H6: +

Table 2
Summary statistics

The table presents descriptive statistics on the business units included in the sample and on the respondents in the survey, who are managers of the business units. The sample consists of 140 observations and is collected by a questionnaire.

Panel A – Summary statistics for the sample business units

Variable	# of observations	Mean	Std. Dev.	Median	5%	95%
Size (# of employees)	139	240.0	339.0	120.0	18.0	750.0
Sales growth (in %)	125	11.7	30.8	6.0	-15.0	75.0
Profit growth (in %)	119	5.3	49.3	4.0	-89.0	95.0
Business unit's relative size in firm (as % of total sales)	124	20.5	21.8	10.0	1.0	63.0
Business unit's relative size in firm (as % of total assets)	108	16.4	21.9	5.5	1.0	74.0

Panel B – Characteristics of the survey respondents (managers of business units).

Variable	# of observations	Mean	Std. Dev.	Median	5%	95%
Experience in current business unit (in years)	139	6.5	7.1	4.0	1.0	23.0
Experience in current position (in years)	139	4.0	4.0	2.0	1.0	13.0
Experience in firm compared with superior (in years, positive numbers indicate more experience)	118	11.7	11.7	-1.5	-5.0	15.0
Experience in industry compared with superior (in years, positive numbers indicate more experience)	118	13.6	13.6	-2.5	-25.0	15.0
Age (1= younger than 30, 2=30-34, 3=35-39, 4=40-44, 5=45-49, 6=older than 50)	139	3.9	1.5	4.0	2.0	6.0
Highest level of education (1=high school only, 2=some college, 3=university degree)	137	2.6	0.6	3.0	2.0	3.0

Table 3

Summary statistics for questionnaire items used to construct the latent variables of authority of business unit managers, interdependencies, and information asymmetry.

The table presents the distribution of each questionnaire item used to construct the three latent variables in this study. The sample consists of 140 observations and is collected by a questionnaire. The theoretical range for all items is 1–7. Refer to the Appendix for a complete description of all survey items and their associated scales.

Survey items	Mean	Std. Dev.	Min.	Median	Max.
<u>Authority of business unit manager:</u> Please compare your authority in making decisions with the authority of your superior. If you or your subordinates in your unit make decisions without prior consent of your superior, you are considered to have all authority.					
Strategic decisions	3.5	1.6	1.0	4.0	7.0
Investment decisions	3.8	1.7	1.0	4.0	7.0
Marketing decisions	5.0	1.9	1.0	6.0	7.0
Human resource decisions	5.3	1.5	1.0	6.0	7.0
<u>Interdependencies:</u>					
To what extent do your unit's actions impact on work carried out in other units of your firm?	4.3	1.7	1.0	4.0	7.0
To what extent do actions of other units of the firm impact on work carried out in your own unit?	4.4	1.7	1.0	5.0	7.0
To what extent could your unit operate as an independent firm on the work (outside the current firm)? [Reverse coded]	2.4	2.1	1.0	1.0	7.0
<u>Information asymmetry:</u> Please compare the amount of information you have relative to your superior.					
How much better informed are you about the type of activities undertaken in your unit?	5.9	1.2	2.0	6.0	7.0
How much more familiar are you with the type of input output relations inherent in the internal operations of your unit?	5.9	1.2	2.0	6.0	7.0
How much more certain are you about the performance potential of your unit?	5.5	1.2	3.0	6.0	7.0
How much more familiar are you with the technical aspects of the work in your unit?	5.7	1.4	1.0	6.0	7.0
How much better are you able to assess the potential impact on your activities of factors internal to your unit?	4.7	1.3	2.0	4.0	7.0
How much better do you understand what can be achieved in your unit?	5.3	1.2	3.0	5.0	7.0

Table 4
Summary statistics for performance measures of business unit managers

The table presents summary statistics about the use of and weight on different performance measures. The panel A sample is based on 140 observations, the sample in Panel B is based on the 81 respondents who are evaluated on accounting return measures. Data is collected by a questionnaire.

Panel A – Summary statistics about the use of and the weight on different performance measures.

The Column ‘Use’ reports the number of business units that use a performance measure in the specified decision context. Mean and median statistics are reported for the weight (0-100%) on a performance measure in each decision context. Standard deviations are reported in parentheses below the mean.

<u>Decision context</u>	Periodic assessment (n=139)			Bonus determination (n=122)			Career-related (n=135)		
<i>Performance measure:</i>	Use	Mean (std.)	Median	Use	Mean (std.)	Median	Use	Mean (std.)	Median
Stock price-related	25	2.7 (7.2)	0.0	22	0.3 (1.9)	0.0	20	1.8 (5.6)	0.0
Non-financial measures	117	20.1 (17.5)	15.0	87	18.7 (22.4)	10.0	116	25.6 (20.6)	22.5
Profit measures	127	39.4 (24.6)	33.0	119	47.1 (33.7)	50.0	116	32.5 (23.6)	30.0
Disaggregated measures	115	21.8 (15.6)	20.0	74	14.2 (18.1)	0.0	88	17.1 (17.6)	15.0
Accounting return measures	81	14.3 (20.7)	7.0	54	12.9 (25.7)	0.0	54	9.9 (17.0)	0.0
Other measures	14	1.9 (6.7)	0.0	41	6.3 (15.2)	0.0	46	13.2 (25.5)	0.0

Panel B – Detailed information about the type of accounting return measure used in the evaluation of business unit managers.

Description of the type of accounting return measures and its frequency among the 81 respondents who indicated that accounting return measures are used for periodic assessment of their performance.

<u>Type of accounting return measure used:</u>	
Return on investment, return on net assets, return on capital employed	68%
Residual income, economic value added	18%
Cash flow return on investment	11%
Shareholder value added	3%
Total:	100%

Table 5
Pearson correlations between all variables

Cell entries represent the across-model average Pearson correlation. Size is the natural logarithm of the number of employees that work in the business unit of the respondent. The indicator variables for financial service or other service industries assume the value of unity when the business unit is operating in the corresponding industry. All other variables are described in the appendix. The construction of the latent variables in PLS varies across the different causal models, which in turn affects the correlation between the latent variables and all other variables. Correlations are based on up to 140 observations collected by a questionnaire. Significance levels are aggregated across models and determined, under the assumption of independent samples, by a chi-square test.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Weight on accounting return measures	-								
2. Weight on profit measures	-0.39***	-							
3. Weight on disaggregated measures	-0.28***	-0.29***	-						
4. Weight on non-financial measures	-0.20**	-0.46***	0.06**	-					
5. Authority of business unit managers	0.31***	-0.27***	-0.11	0.01	-				
6. Interdependencies	-0.20***	-0.16**	0.31***	0.28***	-0.36***	-			
7. Information asymmetries	0.06	-0.12	-0.16**	0.07***	0.43***	-0.12***	-		
8. Size of the business unit	0.20***	-0.21***	-0.05	0.05	0.12***	-0.11	0.13***	-	
9. Indicator variable for financial service industry	0.05	0.01	-0.04	0.07**	0.06	0.03	0.08	-0.06	-
10. Indicator variable for other service industries	-0.22***	0.11**	0.14***	-0.02	-0.06	-0.02	-0.09	0.00	-0.25***

Notes: *, **, *** denotes significance at the 10%, 5%, and 1% level (two-tailed).

Table 6

Partial least squares regressions examining the association between the weight on type of performance measure and authority of business unit managers and interdependencies (refer to the appendix for variable definitions)

The table presents PLS regressions based on 140 (119 for bonus determination) observations. Independent variables are the authority of business unit managers, interdependencies between business units within the firm, and information asymmetry between respondent and superior, as well as (untabulated) size and industry controls. Absolute values of *t*-statistics based on a bootstrapping procedure are in parentheses. *, **, *** denotes significance at the 10%, 5%, and 1% level, respectively. Reported *p*-values are one-tailed for variables with a directional prediction and two-tailed otherwise. NP = no relation predicted.

Panel A – Dependent variable: weight on accounting return measures

Path from:	Decision context			
	Predicted Sign	Periodic assessment	Bonus determination	Career-related decisions
<i>Test variables:</i>				
Authority of business managers	+,+,+	0.33*** (3.16)	0.34*** (3.12)	0.25** (1.99)
Interdependencies	-, -, -	-0.08 (0.85)	-0.14* (1.64)	-0.13 (1.25)
<i>Control variable:</i>				
Information asymmetry	NP	-0.10 (0.98)	-0.22** (1.98)	-0.19 (1.53)
Multiple R2		22.7%	21.8%	13.7%

Panel B – Dependent variable: weight on profit measures

Path from:	Decision context			
	Predicted Sign	Periodic assessment	Bonus determination	Career-related decisions
<i>Test variables:</i>				
Authority of business managers	NP	-0.35** (2.29)	-0.37** (2.06)	-0.24 (1.42)
Interdependencies	NP	-0.38*** (4.24)	-0.36*** (2.89)	-0.10 (0.77)
<i>Control variable:</i>				
Information asymmetry	NP	0.07 (0.52)	-0.02 (0.18)	-0.09 (0.71)
Multiple R2		19.3%	31.2%	12.1%

Panel C – Dependent variable: weight on disaggregated measures

Path from:	Decision context			
	Predicted Sign	Periodic assessment	Bonus determination	Career-related decisions
<i>Test variables:</i>				
Authority of business managers	NP	-0.04 (0.29)	0.18 (1.26)	0.04 (0.20)
Interdependencies	+,+,+	0.17* (1.58)	0.48*** (4.23)	0.29*** (2.41)
<i>Control variable:</i>				
Information asymmetry	NP	-0.18* (1.66)	0.00 (0.18)	-0.03 (0.16)
Multiple R2		11.5%	22.4%	10.8%

Panel D – Dependent variable: weight on non-financial measures

Path from:	Decision context			
	Predicted Sign	Periodic assessment	Bonus determination	Career-related decisions
<i>Test variables:</i>				
Authority of business manager	NP	0.06 (0.48)	0.00 (0.02)	0.03 (1.12)
Interdependencies	+,+,+	0.46*** (4.84)	0.42*** (3.67)	0.13 (1.17)
<i>Control variable:</i>				
Information asymmetry	NP	0.14 (1.26)	0.23 (1.06)	0.02 (0.13)
Multiple R2		19.6%	17.6%	4.8%

Table 7

Partial least squares regressions examining the association between the authority of business unit managers and information asymmetry and interdependencies (refer to the appendix for variable definitions)

The table presents the distribution of the coefficient estimates from 12 regressions in which the authority of business unit managers is the dependent variable and interdependencies between business units within the firm and information asymmetry between respondent and manager as well as (untabulated) size and industry controls are the independent variables. Below the mean coefficient estimate, in parentheses, is the average of 12 *t*-statistics on the corresponding coefficient. Under the assumption of independent samples, chi-square tests consider the joint null hypothesis that the *t*-statistic on a given variable in all models is less than or equal to zero.

Path to authority of business unit managers	Multiple R ² range = [26.0% - 33.3%]					
Path from:	Mean (average <i>t</i> -statistic)	Chi-square test, df. = 30 (<i>p</i> -value)	Std.	Min.	Max.	# of significant paths (max. = 12)
Information asymmetry	0.44 (3.69)	207.7 (<0.001)	0.05	0.38	0.53	12
Interdependencies	-0.22 (-2.37)	100.1 (<0.001)	0.05	-0.27	-0.08	10

Appendix

Weight on type of performance measure

We measure the weight on performance metrics in three decision contexts: (1) periodic assessment, (2) bonus determination, and (3) career decisions. Only the heading differs across the three decision contexts; we therefore replicate the common part of the instrument just once.

1. We wish to understand the relative importance of performance measures used to assess your business unit's performance. Given below are descriptions of performance measures. Depending on the context in which you operate, your supervisor has (implicitly or explicitly) assigned weights to each of these measures to assess your unit's performance. We would like you to indicate these weights for each of these measures. Your answers should total 100%.

<i>Performance metric:</i>	<i>Example</i>	<i>%weight</i>
Stock price-related measures		
Non-financial measures	Market share, customer satisfaction, quality	
Profit measures	Net income, profit margin, operating profit	
Disaggregated measures	Costs, revenues	
Return measures	Please check below the measure used:	
	<ul style="list-style-type: none"> • Return on investment, return on net assets, return on capital employed 	
	<ul style="list-style-type: none"> • Residual income 	
	<ul style="list-style-type: none"> • Economic value added 	
	<ul style="list-style-type: none"> • Cash flow return on investment 	
	<ul style="list-style-type: none"> • Shareholder value added 	
	<ul style="list-style-type: none"> • Other return metric, please specify its computation: 	
Other measures, not mentioned above	Please specify	

2. Please indicate for each the performance measures below the weight assigned to determine your bonus. You may either supply the weights that are specified by the specific rules or company regulations that exist in your firm, or in the absence of such specific rules, you should supply the weights used by your superior determining your bonus. Your answers should total 100%.
3. We would like to know how important the performance measures listed below are when decisions are made about your (longer term) career. Please indicate the weight each measure receives when decisions about your career are made by your superior. Your answers should total 100%.

Authority of business unit managers

In this section, we would like you to compare your authority with the authority of your superior on the following decisions.

1. Strategic decisions (e.g., development of new products; enter and develop new markets; your unit's strategy)
2. Investment decisions (e.g., acquiring new plants, property and equipment, development of new information systems)
3. Marketing decisions (e.g., campaigns, pricing decisions)
4. Human resource decisions (e.g., hiring and firing; compensation and setting career paths for the personnel employed within your unit; reorganizing your unit; creation of new jobs)

If you and/or any of your subordinates make the decision without the prior consent of your supervisor, you and/or others of your unit are considered to have *all* authority.

We use the following Likert scale for all items: 1 = My superior has all authority; 4 = My superior and I have the same authority; 7 = My unit has all authority.

1. Strategic decisions
2. Investment decisions
3. Marketing decisions
4. Human resource decisions

Interdependencies between business units

This section relates to the relationships between your business unit and other units.

The next two items use the following Likert scales: 1 = No impact at all; 4 = Some impact; 7 = A very significant impact.

1. To what extent do your business unit's actions impact on work carried out in *other* units of your firm?
2. To what extent do actions of managers of other business units of the firm impact on work carried out in *your* particular unit?

The item below uses the following Likert scale: 1 = Not at all; 4 = For about half of the business; 7 = For all business.

3. To what extent could your business unit operate as a stand-alone business?

Information asymmetry between business unit managers and their superiors

In this section, we are interested in the way in which information is distributed in your firm.

The next three items use the following Likert scale: 1= My superior is much more familiar; 4 = We are about equally familiar; 7 = I am much more familiar.

1. Compared to your superior, who is in possession of better information regarding the activities undertaken in your business unit?
2. Compared to your superior, who is more familiar with the input-output relationships inherent in the internal operations of your business unit?
3. Compared to your superior, who is more familiar technically with the work of your business unit?

The next item uses the following Likert scale: 1= My superior is much more certain; 4 = we are about equally certain; 7 = I am much more certain.

4. Compared to your superior, who is more certain about the performance potential of your organizational unit?

The two items below use the following Likert scale: 1 = My superior has a much better understanding; 4 = We have about the same understanding; 7 = I have a much better understanding.

5. Compared to your superior, who is better able to assess the potential impact on your activities of factors external to your business unit?
6. Compared to your superior, who has a better understanding of what can be achieved in your business unit?

Higher-level measures

We would like to acquire information on the relative importance of firm level, divisional level, and business unit level performance measures. Given below are descriptions of performance measures. Depending on the context you operate in your supervisor has assigned weights to each of these measures to assess your unit's performance. We would like you to indicate these weights for each of these measures. Your answers should total 100%.

<i>Performance metric</i>	<i>%weight</i>
i. Stock-price related measures	
ii. Firm-level performance measures (e.g., firm output, firm ROI, firm profit margins, firm income)	
iii. Measures summarizing the total performance of the division you belong to (e.g., the division's income, the division's EVA, the division's ROI, divisional output)	
iv. Measures summarizing the total performance of your business unit (e.g., your business unit's income, business unit EVA or ROI, business unit output)	
v. Measures that provide performance information on specific aspects within your business unit (e.g., R&D, production efficiency or quality programs, unit product costs)	
vi. Other measures not mentioned (please specify).....	
	Total 100%

We sum the weights on (i) stock price-related measures, (ii) measures defined at the firm level, and (iii) measures defined at the divisional level. Together, these represent the weight on higher-level measures, and we include this variable in the regressions described in Section 4.2.3.

Follow-up questions on investment authority

Please answer the following questions with yes or no:

1. I can decide about the amount of investment spending within my unit without permission from my superior.
2. If my unit needs a new building, I can decide to purchase, rent or build one without asking permission from my superior.
3. If my unit requires equipment to be replaced I can decide to do so without prior permission from my superior.
4. If my unit faces capacity constraints, I can increase capacity without asking permission from my superior.
5. I can decide about the amount of research and development spending within my unit without permission from my superior.
6. I can decide about the spending on developing new products or services within my unit without permission from my superior.
7. If a planned investment exceeds €_____ (please complete), I need prior permission from my superior.

Fig. 1. Causal model

